

## CLAIMS

### WHAT IS CLAIMED IS:

1                    1.     A method for determining an inverse response function of a camera,  
2     the method comprising:  
3                    finding a first pixel in an output image of the camera in which the first pixel  
4     images a first region having a first color and a second region having a second color, the  
5     first pixel representing a blended color derived from the first and second colors, wherein  
6     the first and second colors serve as component colors of the blended color;  
7                    obtaining the camera's measurements of the first and second colors;  
8                    obtaining the camera's measurement of the blended color; and  
9                    finding a function that maps the measurements of the first, second and  
10     blended colors into a linear distribution in a color space.

1                    2.     The method of claim 1, further comprising:  
2                    finding a plurality of pixels in the output image in which each pixel of the  
3     plurality of pixels images two regions of different colors and represents a blended color  
4     derived from the different colors, wherein the different colors of each pixel serve as  
5     component colors of that pixel's blended color;  
6                    obtaining the camera's measurements of the different colors of each pixel  
7     of the plurality of pixels;  
8                    obtaining the camera's measurement of the blended colors of the plurality  
9     of pixels; and

10                    finding a function that maps the measurements of the colors of the first  
11 pixel and the plurality of pixels into a linear distribution in the color space.

1                    3.        The method of claim 1, wherein the measurement of the first color is  
2 obtained from a second pixel that images only the first color.

1                    4.        The method of claim 1, wherein the second pixel is adjacent to the  
2 first pixel.

1                    5.        The method of claim 1, wherein finding a function that maps the  
2 measurements of the first, second and third colors into a linear distribution further  
3 comprises determining a distance function that minimizes a sum of distances of each  
4 mapped blended color measurement to a line segment connecting the blended color's  
5 mapped component colors in the color space.

1                    6.        The method of claim 2, wherein finding a function that maps the  
2 measurements of the colors of the first pixel and the plurality of pixels into a linear  
3 distribution further comprises determining the function with dependence on  
4 predetermined response functions of known cameras.

1                    7.        The method of claim 1, further comprising using a Bayesian  
2 estimation algorithm to determine the function.

1                   8.     The method of claim 6, further comprising modeling the  
2     predetermined response functions as a Gaussian mixture model.

1                   9.     The method of claim 5, further comprising incorporating the  
2     distance function into an exponential distribution function.

1                   10.    The method of claim 2, further comprising finding a maximum a  
2     posteriori (MAP) solution formulated as the product of a prior model and a likelihood  
3     function, wherein the prior model is a Gaussian mixture model derived from  
4     predetermined response functions, and the likelihood function is an exponential  
5     distribution function derived from distances of each mapped blended color measurement  
6     to a line segment connecting the blended color's mapped component colors in the color  
7     space, the inverse response function being derived from the MAP solution.

1                   11.    A machine readable medium having instructions for performing the  
2     method of claim 1.

1                   12.    A system comprising:  
2                    an edge pixel detector to find a plurality of pixels in a digital image in  
3     which each pixel images a first region having a first color and a second region having a  
4     second color, that pixel representing a blended color derived from the first and second  
5     colors, wherein the first and second colors serve as component colors of the blended  
6     color of that pixel;

7                   a color analyzer operatively coupled to the edge pixel detector, wherein the  
8   color analyzer is to obtain measurements of the blended and component colors of the  
9   plurality of pixels; and  
10                  an inverse response generator to generate an inverse response function that  
11   maps the measurements of the blended and component colors of the plurality of pixels  
12   into a linear distribution in a color space.

1                  13.   The system of claim 12 wherein the inverse response generator is to  
2   determine a distance function that, for the plurality of pixels, minimizes a sum of  
3   distances of each mapped blended color measurement to a line segment connecting the  
4   blended color's mapped component colors in the color space.

1                  14.   The system of claim 12, further comprising a datastore to contain  
2   reference data comprising predetermined response functions of known cameras, wherein  
3   the inverse response generator is to determine the inverse response function with  
4   dependence on the reference data of the datastore.

1                  15.   The system of claim 14, wherein the inverse response generator is  
2   further to use a Bayesian estimation algorithm to determine the inverse response function.

1                   16.    The system of claim 14, wherein the inverse response generator is  
2 further to model the predetermined response functions as a Gaussian mixture model.

3                   17.    The system of claim 13, wherein the inverse response generator is  
4 further to incorporate the distance function into an exponential distribution function.

1                   18.    The system of claim 12, wherein the inverse response generator is  
2 further to determine a maximum a posteriori (MAP) solution as the product of a prior  
3 model and a likelihood function, wherein the prior model is a Gaussian mixture model  
4 derived from predetermined response functions, and the likelihood function is an  
5 exponential distribution function derived from distances of each mapped blended color  
6 measurement to a line segment connecting the blended color's mapped component colors  
7 in the color space, the inverse response function being derived from the MAP solution.

1                   19.    The system of claim 18, wherein the MAP solution serves at the  
2 inverse response function.

1                   20.    The system of claim 18, wherein the inverse function generator is to  
2 determine the MAP function using a Levenberg-Marquardt optimization method.

1                   21.    A machine readable medium having components implementing the  
2   system as recited in claim 12.

3                   22.    A machine-readable medium having components, comprising:  
4                   means for finding a plurality of pixels in the output image in which each  
5   pixel of the plurality of pixels images two regions of different colors and represents a  
6   blended color derived from the different colors, wherein the different colors of each pixel  
7   serve as component colors of that pixel's blended color;

8                   means for obtaining measurements of the different colors of each pixel of  
9   the plurality of pixels;

10                  means for obtaining measurements of the blended colors of the plurality of  
11   pixels; and

12                  means for determining an inverse response function that maps the  
13   measurements of the colors of the plurality of pixels into a linear distribution in the color  
14   space.

1                   23.    The machine-readable medium of claim 22, wherein the means for  
2   determining an inverse response function further comprises means for generating a  
3   distance function that minimizes a sum of distances of each mapped blended color  
4   measurement to a line segment connecting the blended color's mapped component colors  
5   in the color space.

1           24.    The machine-readable medium of claim 22, wherein the means for  
2   determining an inverse response function is further to determine the function with  
3   dependence on predetermined response functions of known cameras.

1           25.    The machine-readable medium of claim 24, further comprising  
2   means for modeling the predetermined response functions as a Gaussian mixture model.

1           26.    The machine-readable medium of claim 23, further comprising  
2   means for incorporating the distance function into an exponential distribution function.

3           27.    The machine-readable medium of claim 22, further comprising  
4   means for finding a maximum a posteriori (MAP) solution as the product of a prior  
5   model and a likelihood function, wherein the prior model is a Gaussian mixture model  
6   derived from predetermined response functions, and the likelihood function is an  
7   exponential distribution function derived from distances of each mapped blended color  
8   measurement to a line segment connecting the blended color's mapped component colors  
9   in the color space, the inverse response function being derived from the MAP solution.

1           28.    The machine-readable medium of claim 27, wherein the MAP  
2   solution serves as the inverse response function.

1                    29.    The machine-readable medium of claim 27, wherein the means for  
2    finding a MAP solution uses a Levenberg-Marquardt optimization method to find the  
3    MAP solution.

1                    30.    A method for determining an inverse response function of a camera,  
2    the method comprising:  
3                    receiving a single image of which at least some of the single image's scene  
4    colors are not known a priori;  
5                    obtaining a plurality of measured colors from the single image; and  
6                    determining a function using the measured colors that maps colors of the  
7    single image into a linear distribution.

1                    31.    The method of claim 30 wherein the measured colors are selected  
2    from a plurality of pixels of the single image, wherein each pixel of the plurality of pixels  
3    images a first region having a first color and a second region having a second color;

1                    32.    The method of claim 31 wherein a measurement of the first color of  
2    a pixel of the plurality of pixels is obtained from another pixel of the single image that is  
3    adjacent to the pixel.